PTO 03-4644

Japanese Patent

Document No. Hei 6-48189

HYBRID AUTOMOBILE

[Haiburido Jidosha]

Shinichiro Kitada, Shigeo Muranaka, Nobukazu Kanesaki, Hirotaka Kumakura, Mitsunori Ishii, Msayoshi Sugimoto, and Shigeki Yoshioka

UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D.C. August 2003

Translated by: Schreiber Translations, Inc.

Country	:	Japan
Document No.	:	Hei 6-48189
Document Type	:	Kokai
Language	:	Japanese
Inventor	:	Shinichiro Kitada, Shigeo Muranaka, Nobukazu Kanesaki, Hirotaka Kumakura, Mitsunori Ishii, Msayoshi Sugimoto, and Shigeki Yoshioka
Applicant	:	Nissan Motor Co., Ltd.
IPC	:	B 60 K 6/00, 8/00, F 02 B 61/00, F 02 D 29/02
Application Date	:	July 24, 1992
Publication Date	:	February 22, 1994
Foreign Language Title	:	Haiburido Jidosha
English Title	:	HYBRID AUTOMOBILE

Claim

1. A hybrid automobile, characterized by the fact that in a hybrid automobile that is equipped with a motor and an engine being driven by a current being supplied from a storage battery as running power sources and has a structure for charging the above-mentioned storage battery by driving a power generator through the drive of the engine, it is equipped with a means that detects the temperature state of the engine and a means that stores the engine or lightens the load of the engine when the detected temperature of the temperature state detection means exceeds a prescribed value.

Detailed explanation of the invention

[0001]

(Industrial application field)

The present invention pertains to a power control means of a hybrid automobile equipped with a motor and an engine as running power sources.

[0002]

(Prior art)

[1] Numbers in the margin indicate pagination in the foreign text.

From viewpoints of the reduction of harmful components such as NOx being included in an exhaust gas of an automobile and the energy saving, a hybrid automobile using a motor and an engine as running power sources have recently been highlighted, and in the hybrid automobile, when the engine output exceeds an output required for running, a power generator is driven by the extra output and charged in a storage battery. On the other hand, when the engine output is deficient at the output required for acceleration, etc., the motor is driven by the power of the storage battery, and the deficiency of the engine output is compensated by the output (Complete Automobile Engineering 8 "Electric Automobile, New Motor," p.69-72, October 15, 1980, published by Sankaido).

[0003]

(Problems to be solved by the invention)

In such a hybrid automobile, an engine carries out a rated operation for the charge, even during the stop. However, since the engine could not be cooled with a running air during the stop, the engine was overheated in accordance with the operation conditions of the engine.

[0004] The present invention solves the above-mentioned problems, and its purpose is to provide an overheat prevention function to a hybrid automobile.

[0005]

(Means to solve the problems)

The present invention is characterized by the fact that in a hybrid automobile that is equipped with a motor and an engine being driven by a current being supplied from a storage battery as running power sources and has a structure for charging the above-mentioned storage battery by driving a power generator through the drive of the engine, it is equipped with a means that detects the temperature state of the engine and a means that stores the engine or lightens the load of the engine when the detected temperature of the temperature state detection means exceeds a prescribed value.

[0006]

(Operation)

If the temperature is raised beyond a prescribed value, the load of the engine is lightened by stopping the operation of the engine or stopping the power generation of the power generator, the engine is prevented from being overheated.

[0007]

(Application examples)

Figures 1-6 show application examples of the present invention.

[0008] Figure 1 shows the constitution of a power mechanism of the hybrid automobile. 1 is a water cooling type engine being operated under a coolant circulation system equipped with a radiator 3. A power generator 2 is connected to the engine 1, and a battery 7 is connected to the power generator 2.

[0009] The operation of the engine 1 is controlled by an engine controller 4. A water temperature detector 5 for detecting the water temperature of the radiator 3 is connected as a temperature state detection means is connected to the engine controller 4, and a charge state detector 6 for detecting the charge state of the battery 7 is connected. The water temperature detector 5, for example, is constituted by a thermistor, and the charge state detector 6, for example, is constituted by a gravity meter of a battery liquid charged in the battery 7.

[0010] The engine 1 during the operation is operated at a constant rotation by a burner which is not shown in the figure, and the engine controller 4 controls the start and stop of the engine 1 in accordance with the water temperature being detected by the water temperature detector 5 and the charge state of the battery 7 being detected by the charge state detector 6.

[0011] In other words, for example, when the water temperature is 95°C or lower and the amount being charged is lowered to 40%

or less of a full amount being charged, the engine 1 is started, and when the amount being charged is more than 80%, the operation of the engine 1 is stopped.

[0012] If the water temperature is 95-110°C, when the amount being charged is lowered to 20% or less, the engine 1 is started, and if the amount is more than 40%, the operation of the engine 1 is stopped.

[0013] Also, if the water temperature is higher than 110°C, the engine 1 is not operated.

[0014] On the other hand, the output current of the battery 7 is supplied to a motor 8 via a motor controller 9. An accelerator overstep quantity detection mechanism 10 is connected to the motor controller 9, and if the amount of accelerator overstepped, which is detected by the accelerator overstep quantity detection mechanism 10, reaches a prescribed value or higher, the motor controller 9 operates the motor 8.

[0015] Also, the motor 8 is connected to wheels via a speed reducer, which is not shown in the figure, and rotates and drives the wheels by interlocking with the engine 1.

[0016] Next, the operation is explained.

[0017] The engine 1 is controlled by the engine controller 4 according to a flow chart shown in Figure 2.

[0018] In other words, first, whether or not the water temperature is 95°C or lower is decided from the output of the water temperature detector 5 (S1). If the water temperature is 95°C or lower, when the amount of battery 7 being charged is 80% or more during the operation of the engine 1 (S2), the operation of the engine 1 is stopped (S3, S9), and when the amount being charged is less than 80%, the operation of the engine 1 is continued (S3, S10). Also, at S2, when the engine 1 is stopped, whether or not the amount of battery being charged is 40% or more is decided (S4). If the amount is 40% or more, it is decided that the charge is not required, and the operation stop state is continued (S9), and if the amount is less than 40%, /3 the engine 1 is started (S10).

[0019] On the other hand, at S1, when the water temperature is 95°C or higher, whether or not the water temperature is 110°C or higher is decided (S5), and if the water temperature is 110°C or higher, the operation of the engine 1 is stopped (S9).

[0020] When the water temperature is lower than 110°C, if the engine 1 is in an operated state (S2), a decision similar to that at S4 is made at S7, and the operation of the engine 1 is stopped (S9) or continued (S10). Also, at S2, if the engine 1 is stopped, whether or not the amount of battery 7 being charged is 20% or more is decided (S8). If the amount is 20% or more,

the engine 1 is not started (S9), and the engine 1 is started only if the amount is less than 20% (S10).

[0021] As a result of this control, the operation of the engine 1 exhibits three kinds of patterns as shown in Figure 3, assuming the water temperature of 95°C and 110°C as a boundary. In other words, when the water temperature is lower than 95°C, the engine is relatively frequently operated in accordance with the decrease of the amount being charged, however when the water temperature is higher than 95°C, the engine is operated only when the amount being charged is largely lowered. If the water temperature is higher than 110°C, the engine 1 is not operated, regardless of the amount being charged.

[0022] Thus, since the operation of the engine 1 is controlled in accordance with the water temperature of the radiator 3, the engine 1 is not overheated, even if the cooling conditions are poor, for example, during the stop in which a running air cannot be used in cooling.

[0023] Also, in the above-mentioned application example, the operation of the engine 1 is controlled based on the water temperature, however the operation of the power generator 2 can also be controlled based on the water temperature.

[0024] In this case, the power generator 2 is constituted as shown in Figure 4. In the figure, 21-23 are armature coils, 24

is a field coil, 25 is a rectifier, 26 is a power transistor, and 27 is a comparator. 28 is an output voltage setter and outputs a target value of the power generation voltage in accordance with the output of the water temperature detector 5. The target value is set as shown in Figure 5, and when the water temperature is in a range of 95-110°C, the power generation voltage is lowered. As a result, the power generation output is changed from 10 kW to 0 kW in this range and lightens the load of the engine 1 in accordance with the output decrease.

[0025] Figure 6 shows another application example, and the output voltage of the power generator 2 is changed by the power transistor 12. At the same time, the control device 11 controls the power transistor 12 in accordance with the detected water temperature of the water temperature detector 5 and lowers the power generation output in accordance with the water temperature rise similarly to the application example of Figures 4 and 5.

[0026] Also, in any of the above-mentioned each application example, the engine or power generator is controlled based on the coolant temperature of the water-cooling engine, however an air-cooling engine may be similarly controlled by block wall temperature sensor, etc.

[0027]

(Effects of the invention)

As mentioned above, according to the present invention, if the engine temperature is raised to a prescribed value or higher, the engine is stopped, or the load of the engine is lightened. Thus, the engine can be prevented from being overheated under unfavorable cooling conditions in which a running air cannot be utilized, for example, in a stop state.

Brief description of the figures

Figure 1 is a block diagram showing a power device of the hybrid automobile of an application example of the present invention.

Figure 2 is a flow chart for explaining the control operation of an engine controller.

Figure 3 is a graph showing the relationship between the water temperature and the engine operation state.

Figure 4 is a circuit diagram showing a power generator controller in another application example of the present invention.

Figure 5 is a graph showing the relationship between the water temperature and the power generator output.

Figure 6 is a block diagram showing a power device of the hybrid automobile of another application example of the present invention.

Explanation of numerals:

1 Engine

2 Power generator

4 Engine controller

5 Water temperature detector

【図1】

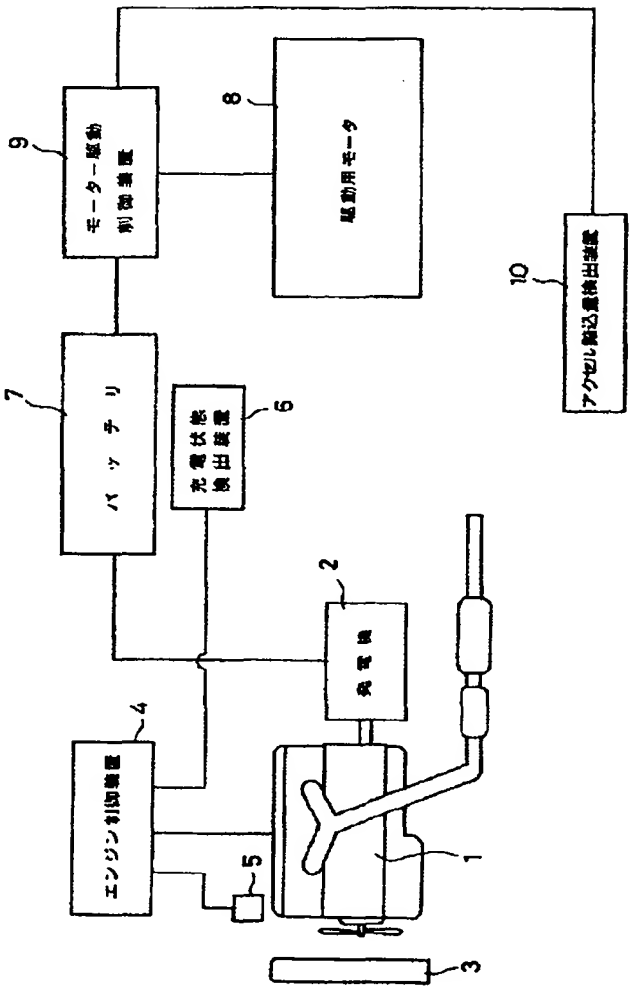


Figure 1:

2 Power generator

4 Engine controller

6 Charge state detector

7 Battery

8 Motor for driving

9 Motor drive controller

10 Accelerator overstep quantity detector

【図2】

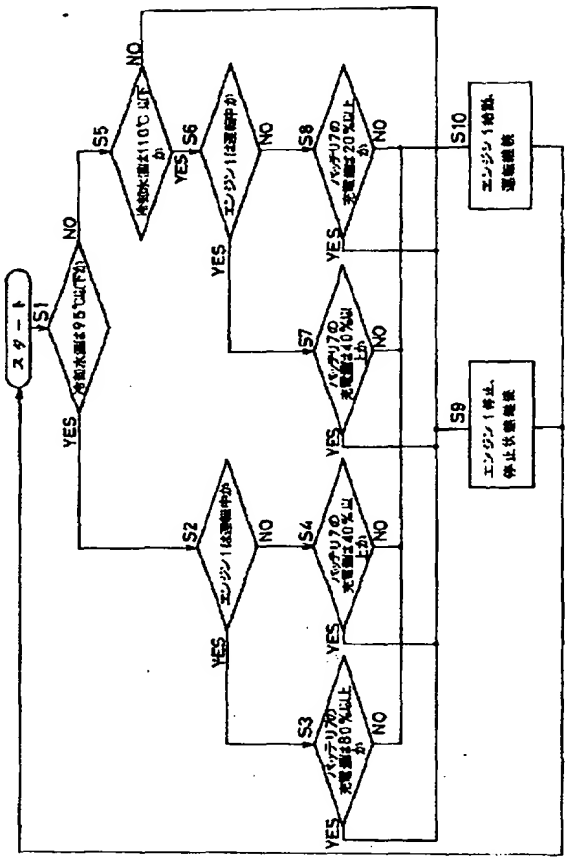


Figure 2:

1. Start

S1 Whether or not the coolant temperature is 95°C or lower?

S2 Whether or not the engine 1 is operated?

S3 Whether or not the amount of battery 7 being charged is 80% or more?

S4 Whether or not the amount of battery 7 being charged is 40% or more?

S5 Whether or not the coolant temperature is 110oC or lower?

S6 Whether or not the engine 1 is operated?

S7 Whether or not the amount of battery 7 being charged is 40% or more?

S8 Whether or not the amount of battery 7 being charged is 20% or more?

S9 Stop of engine 1, continuation of the stop state

S10 Start of engine 1, continuation of the operation

【図3】

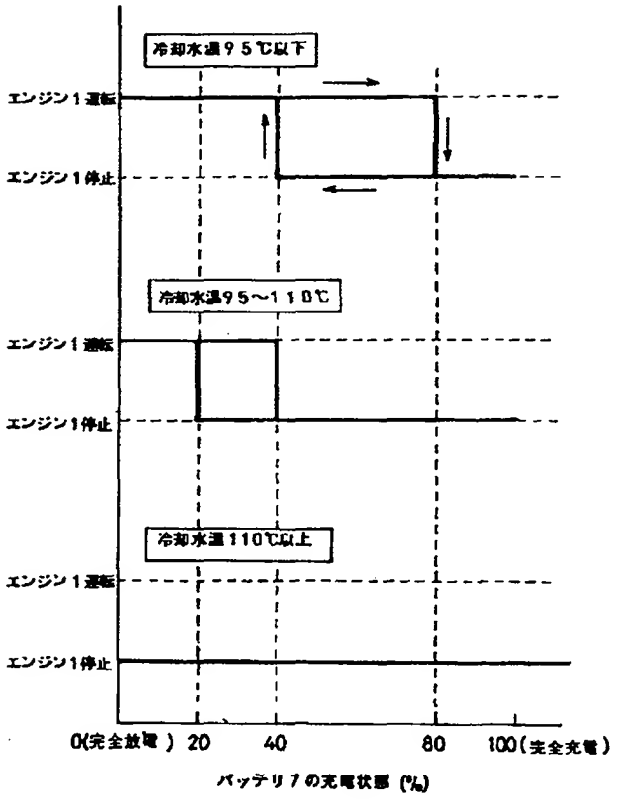
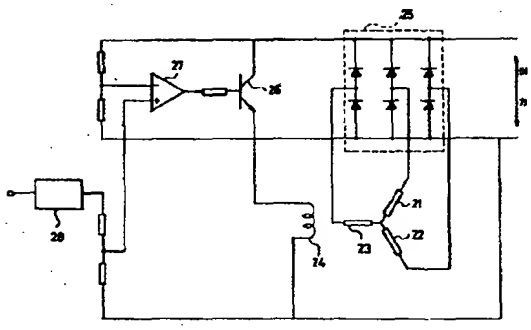


Figure 3:

1. Coolant temperature of lower than 95°C
2. Operation of engine 1
3. Stop of engine 1
4. Coolant temperature of 95-100°C
5. Coolant temperature of higher than 110°C
6. 0 (complete discharge)
7. 100 (complete charge)
8. Charge state of battery 7 (%)

【図4】



【図5】

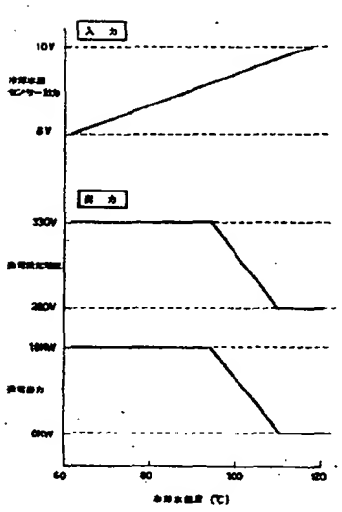


Figure 4:

1. Output

Figure 5:

1. Input
2. Coolant temperature sensor output
3. Output

4. Power generator set voltage

5. Power generation output

6. Coolant temperature (°C)

【図6】

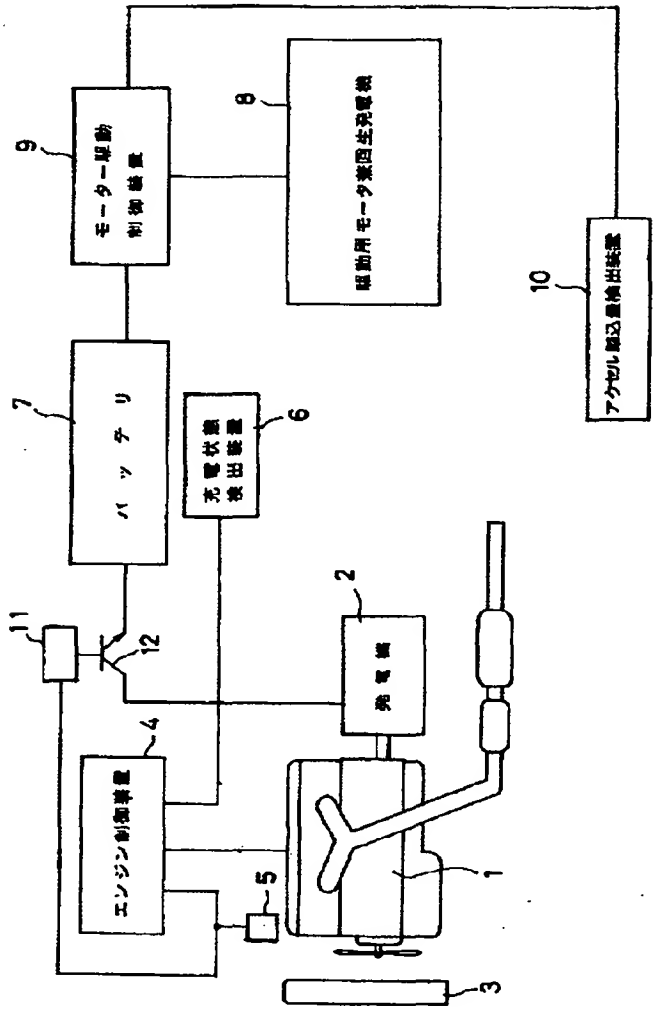


Figure 6:

2 Power generator

4 Engine controller

6 Charge state detector

7 Battery

8 Motor for driving/regenerative power generator

9 Motor drive controller

10 Accelerator overstep quantity detector